Winter 12-5-2005

The Webquality Analyser: Benchmarking Industry Websites

John R. Hamilton

Roy Wybrow

The Webquality Analyser: Benchmarking Industry Websites

John Hamilton *, Roy Wybrow**
* James Cook University, Cairns, Australia 4870
John.Hamilton@jcu.edu.au
** James Cook University, Cairns, Australia 4870
Roy.Wybrow@jcu.edu.au

Abstract: The structure and layout of various websites across a wide spectrum of service industries was analysed using the WebQuality Analyser (WQA). The WQA incorporated forty five critical success elements delivered by quality on-line websites. These success elements covered information technology (IT) and marketing-services related sectors, and were further divided into five key drivers encapsulating each sector. Each sector driver was then divided into four or five customer-enabler features (covering structure and function), each with several feature components. A present / absent approach determined each component. A seven-point, Likert scale encapsulated the relative presence of the features of each driver.

Although it houses both measurable and subjective components, the WQA offers a useful means to compare relevant websites, and to understand the differences with respect to one's competitors.

Further investigation of the specific on-line driver ratings demonstrated where key competitive advantage may reside. This benchmarking tool defined website strengths and weaknesses thereby allowing for corrections to the website structure of the specific business. This paper introduces the WQA, and reports on the marketing-services sector of this new benchmarking tool.

Keywords: Service Operations on the Web; benchmarking; website ; analysis ; service value networks ; analysis ; compare.

I. Introduction

Benchmarking delivers a "comparison of a company's performance in certain areas with that of other firms in its industry and / or with those firms that are identified as world class competition in specific functions and operations" [1]. It can also cut across traditional lines, providing opportunities for new and innovative ways to increase performance, and be a "search for industry best practices that lead to superior performance" [2][3]. Modern benchmarking was initiated by Xerox. They modelled their spare parts distribution on the warehousing and distribution practices of L.L. Bean. Since then Xerox has continued to promote best practices. In 2000 the American Productivity & Quality Center recognised Xerox's development of 'proactive strategies to identify, retain, and re-use knowledge so that individual expertise is transformed into real working knowledge.'

Benchmarking, best practice, and reengineering are key pathways to achieving dramatic improvement in critical contemporary areas such as cost, quality, service and speed [4]. Reengineering often involves the disruptive [5] reinventing of processes and / or the substantial redesign of existing procedures, and is not merely the delivery of continuous incremental changes. Reengineering without benchmarking will generally deliver smaller improvements than reengineering with benchmarking [6]. By studying other best practice operations, companies may identify, and import new technologies, skills, structures, training and capabilities [7]. Hence, including these identified best practices may then deliver new competitive advantages [8][9].

Today firms routinely share best practice and benchmarking information, and often seek help from one another to achieve higher quality and better performance. At times they may even jointly market their services to customers or even work closely with their competitors. The Cairns Super-Yacht Cluster [10] now houses over forty local businesses who previously competed with each in the fishing, large marine taxi, and tourist related marine activity sectors. These former competitors collaboratively use their world-class facilities, competitive technologies, and specialist best practice skills to repair, maintain and refit foreign registered super-yachts. They have created a world-class, dynamically benchmarked, business block that in 2004 generated an economic impact of over $40M. This industry has technologically reengineered into a best-in-world super-yacht re-builder.

II. Benchmarking and the Web

Benchmarking, best practice and reengineering also apply to virtual businesses or Internet- based website businesses, and also to those physical businesses incorporating internet-based websites into their business models. Evans [5] suggests that if the entire value chain (including devices, networks, standards, and applications) is handled correctly on the supply side and combined as an e-business, new opportunities for both business agility and competitive value may be extracted. In addition, Evans [5] considers the business's customer-driven demand side with its cost reductions, revenue generation, customer satisfaction, increased productivity, reduced cycle times, speed and flexibility and suggests these functions may be reconfigured to drive innovative use of technologies. He suggests these

Proceedings of the Fifth International Conference on Electronic Business, Hong Kong, December 5-9, 2005, pp. 795 - 803.

attributes, once benchmarked, and assessed, may allow mechanisms that allow the business to differentiate itself from its competitors.

Benchmarking and competitive intelligence gathering activities are necessary website marketing activities. [11] Competitive intelligence delivers a collage of information about selected competitors. This gathered information is then applied to short and long term strategic planning to facilitate better and smarter business decisions [12]. Competitive intelligence involves data collection and storage, data analysis and interpretation, and the dissemination of intelligence. The process is information-based, systematic, and delivers 'actionable information' [13]. Thus a tool to analyse relative website competitiveness will likely be an important aspect of a business's competitive intelligence.

In addition to marketing considerations, latest advances in website-related technologies such as Microsoft Research's 3D TaskGalley [14] offer new ways to present information, and to maximise the quality of information conveyed whilst minimizing the effort applied by the end user. This technology enhancement also impacts on website marketing functions [16]. Microsoft's 3D smart visual website interfaces present more information. This 3D space or room, with information objects arranged on the floor, ceiling and walls, moves the most important information to the front, and the least important information to the back. Hence, the productivity of the website may be enhanced.

Considering web-based business–customer encounters, the bundling of products and services has become another important trend to add value and drive sales. These encounter areas are best delivered via a three pronged approach that incorporates the areas of: marketing, services, and technological application [15][16]. Website visitations, unlike physical business contact times are generally of very short duration, and so require a quick focussing of customer intent. However other advantages remain, these include – open for business 24/7/365 with continuous revenue generation possibilities and ease of modification to on-line 'shopfront', products and services. Lists of website features have been compiled [17], with over 460 features being displayed in one list. Some of these features constitute customer-related 'benchmarkable' areas [18].

Many researchers have investigated various aspects of website benchmarking. Van der Wiele & Brown, [19] focused on information content analysis based on the traditional 4P's (product, price, place, promotion and other website information not fitting the above four categories. Scoring used Whiteley's [20][21] method assigning '0' to indicate absence of a feature's components, or '1' to indicate presence of a component of a feature. This method lends neatly to development of a computerised solution. On rare occasions a subjective decision concerning a component may be required. In this situation a conglomeration of items may blur the decision as to whether a component is rated present or absent.

Today websites are evaluated using a variety of methods including 'web assessment models' [20][21][22]; QFD, 'feature assessment analysis' [23]; 'strategic positioning' [24][25]; 'customer interface marketing design elements' [26]; 'industry-wide comparisons' [16]; 'objective feature presence' [23][28, and various benchmarking systems'. Barton [29] use 0-10 point scales to scale their identified features and analyse these via Ho's [30] customer perception of value added benefits, and via their own Five Quadrants Evaluation Model. Still others use benchmarking teams and Baldridge criteria to evaluate websites [31], but even these measures have not accurately reflected comparisons between websites, especially from an IT services and marketing approach [16].

This paper compiles the combinations of the above research with that of website details [32](w3C.com); hexagonal comparison grid [33]; service value networks [16]; and a 100 point measurement tool (worldsbest website.com) to develop a new model for benchmarking and rating websites. This Web Quality Analyser (WQA) was initially tested on the on-line (or e-business) real estate industry. Subsequently, additional testing indicated it had more general application and the WQA may be applied across the gambit of on-line business ventures. It was also tested against small sole-operator businesses, medium sized operations and through to large portal-sized ventures.

III. Website Marketing Drivers and Component Features

The key structure and function feature components used in assessing the weighting of the five features for each driver within the website information technology sector of services industry are presented under the driver blocks of: functionality, design, content, originality and effectiveness. The drivers for the website marketing-services sector are: company product presence, value adding services, target market, searchability and creative expression. These components and features of the five marketing-services WQA drivers are each discussed next.

III. 1 Company – Product Presence

Product Representation: here products / services are faithfully described; 'sold' to the user as quality items; quality-badged; accurately costed [18] [35][78][79][80].
Product Information: is accurate and concise; linked to databases; linked to additional user information; capable of showing alternative products / services [25][63].
Company Representation: shows the company as modern and professional business [18][80][81].
Company Information: presents relevant company information; accreditations; contacts; 'About Us' [40] [80] [81].

III. 2 Value Adding Services

Value Added Links: cover links to internal or external added-value sites e.g. lending facilities, financial institutions, removalists, etc; are responsive to user demands; cover internal SC members and external peripheral partners)

[18][80][82].

Tools: cover tools available egg mortgage and interest calculators; pathways to further explore the site and retrieve additional personalised information [18][82].

Relevance to product: here a total package of products / services plus additional complementary items may add value to the 'sale' or to the user experience [18][82].

Frequently Asked Questions*:* explain key user questions are offered as progress to sale; give general product /service questions; give points in brief meaningful manner; are helpful and relevant [18][82].

III. 3 Target Market

Portrayal: here properties, are portrayed, accurately targeted to assumed market, markets accurately defined; details offered; product / service accurately & succinctly portrayed [35][83].

Price Range: include accurate segmentation of prices; prices reflect the targeted market, price ranges realistically reflect the demographic of the target market; value for money is apparent [40][41][42][43] [84].

Promotion: shows the site offers promotions relating to targeted markets; promotions effectively positioned to:- website or product / service or demographic of targeted market; promotions well-timed during year [39][82][85].

Segmentation: here target markets are clearly defined; products / services fit the defined segments; users are targeted; personalised service offered [25].

III. 4 Searchability

Price: here a price search is offered; prices are searchable by range, price discounts are explained; competitor prices are compared [18][86].

Locality: asks does name search by locality work; is fuzzy logic or postcode or map or other criteria; used business address is displayed [36][67].

Accuracy: delivers consistency across site; search methods; search accuracy; correct information delivered [18].

Number of Clicks to Content*:* here time on site, min number of mouse clicks to make a sale; Min number of clicks to create a user desired transaction [18][87].

III. 5 Creative Expressions

Video: covers compressed virtual tours; video clips; audio visuals; download quality and time on standard 56kbs modem [18][36][39][88].

Photo: image size and quality professionally presented; photographic tours download promptly; expandable thumbnail photos offered [18][36][37].

Text: text typeface readability; text colour; typeface consistent; overabundance and relevance of text; easily understood text & followed [18][36].

Theme: consistent across site; appropriate; synergy; adds creative content [18][36].

The above twenty key website features (representing the five marketing-services drivers) and their components were systematically investigated across 130 service industry businesses, each operating a strong on-line website presence in their respective marketspace. Websites delivering the highest combined scores possessed more substantial levels of user focussed presence compared to other websites analysed. Researchers suggest sites delivering high user orientated (targeted) presence, will likely hold users' attention for longer periods [18][34]36][38]] [63][64][68], provided the website 'flow' is of high quality [40][41][42][43] enticing them to access a more of information, and, where appropriate, to lead more users to the purchase point. A summary page of the WQA instrument is presented in Table 1.

Table 1: WQA Sample Summary Page

SUMMARY TOTALS - WEBSITE QUALITY ASSESSMENT

Catagories>			SUMMARY WEBSITE TOTALS							SUMMARY MARKETING - SERVICING TOTALS							OVERALL TOTALS		<Catagories	<Column Average
Rating Scale >																	100% max.		< Rating Scale	
Rating Criteria >			Functionality	Design	Content	Originality	Professionalism & Effectiveness	Website Overall Score		Company Product Presence	Additional Services	Target Market	Search-ability	Creative Expressions	Product Overall Score		Total Score (Web+Prod)	Grading %	< Rating Criteria	Average Grading %
.....																			.....	
Company Name																			Company Name	< Rating Criteria
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
			0	0	0	0	0	0		0	0	0	0	0	0		0	0.00	0	0.00
Column Average >			0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00			0.00	< Column Average	0.00
Rating Criteria >			Functionality	Design	Content	Originality	Professionalism & Effectiveness	Website Overall Score		Company Product Presence	Additional Services	Target Market	Search-ability	Creative Expressions	Product Overall Score		Avg.Total Score (Web+Prod)	Average Grading %	< Rating Criteria	

IV. Analysis

The WQA assesses websites using five information technology design drivers – functionality, design, content, originality, and professionalism / effectiveness. These structures offer a position-promotion vehicle for the website. The WQA also incorporates five marketing-services related drivers – company product presence, additional services, target market, searchability, and creative expression. These

relate to the product and / or service, and how the website should be moulded. This paper assesses the marketing-services related drivers of the WQA.

A standard data-collection criterion was used [89]. A multidimensional scaling technique drawing on the combination of subjective (or perception), objective (or measurable), and respondent feature preference (idea patterns) rating scales allowed the comparison of individual business websites [90]. A present ('1') or absent ('0') rating scale similar to those used by Whiteley and Everett [21][23] was used at the feature component level, and was then converted to a feature Likert measure. The traditional seven point 'more' or 'less' Likert scale was adopted as the prime scaling measure for each feature. This summated rating scale actually measured multiple questions in one, with the numeric score reflecting the degree of attitudinal or measurable 'favourableness'.

The ten website drivers – five IT, and five marketing-services related drivers (or factors), presented forty five Likert scale features (indicator variables). Each four or five features influence each driver.

The forty five dataset features (indicator variables representing their respective components) measured, easily met all reliability criteria. These features were then used to compile comparison datasets. The business's ability to deliver desired effects (when compared to its competitors) was thus measurable. Feature presence (or absence) was either measured, or estimated. Individual differences were controlled using a sufficiently large dataset, and a relative effectiveness scale could be produced from the dataset.

Trials with tertiary student groups (across first, third and MBA levels) were conducted over 2003 and 2004. Typically, final year undergraduate student groups, averaged 30 persons per class per location, Students from Sydney, Melbourne, Townsville and Cairns, Singapore and Malaysia participated. These trials delivered a successful website ratings model called the Web Quality Analyser (WQA). This paper reports on the 2005 study, and only considers the marketing-services components of the WQA.

In 2005 the WQA was tested in the business community across Australia. Twenty eight, IT-skilled, data-collectors each rated websites similarly. In addition sixty five marketing persons across Australia tested the marketability drivers. Again feature classifications were rated similarly.

IV. 1 Sample

The sample size consisted of 126 service industry websites. In order to avoid possible bias firms selected were drawn from across the services industry. These included: financial services (3%), hospitality (14%), logistical transportation - including airlines (30%), Real Estate (24%), recruitment and careers (10%), legal services (10%), and tourism (10%). Within these sectors a spectrum of large, medium and small firms were selected. In addition multiple testing of certain areas was conducted to ensure consistency of results.

Predominant businesses were of micro and small to medium size, with approximately 18% fitting the major or global corporation's category. This approximates with the Australian Bureau of Statistics 2004 data where 79% of businesses are small to medium sized industries, and is in accordance with the Australian services industry mix, and implies that the sampling error is low at around +/- 5% for the overall sample.

IV. 2 Dimensionality

Here a large range of components, features and drivers have been identified. Figure 1 summarises the factorial models for each of the five marketing-service sector drivers. As can be seen from this diagram all features (competencies) are considered first order factors.

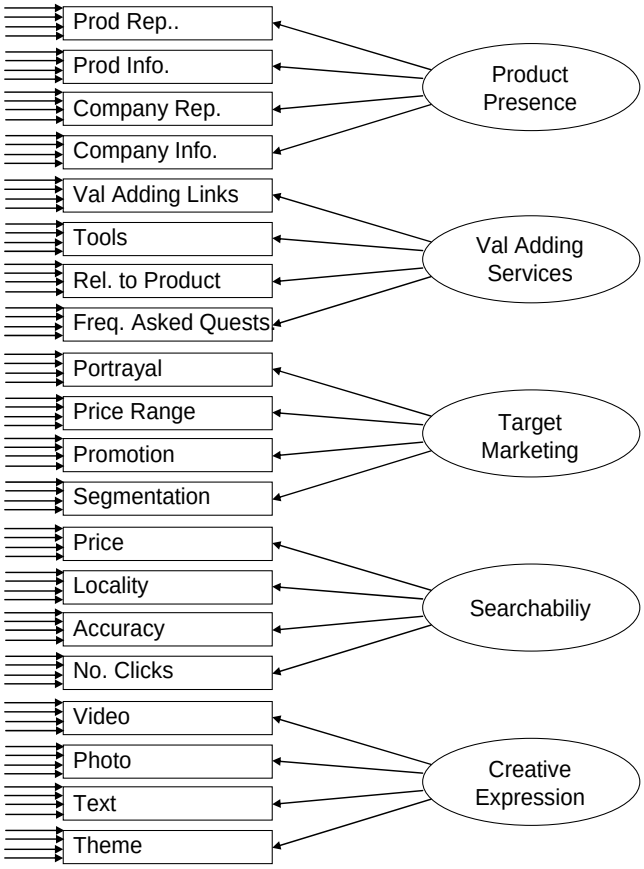

Figure 1: Factorial Model: WQA Marketing-Services Sector

Considering this model and the uniqueness of each service sector driver, a confirmatory factor analysis (CFA) was conducted and an estimation of the model was theoretically deduced from each scale.

Dimensionality of the tool was tested utilising factor analysis using Varimax rotation across all twenty indicators (termed features, and listed in section 3.6. to 3.10 above) to reduce these indicator variables into the predicted model five factor areas. Factor analysis tested appropriateness of the indicators divisions into the selected driver groups as used in the WQA. The Kaiser-Meyer-Olkin measure of sampling adequacy yielded a value of greater than 0.6, being 0.894,

with Bartlet's tests for sphericity at 0.000, being highly significant, (with 190 degrees of freedom). Thus indicating factor analysis was deemed appropriate. Using the Varimax rotation method with Kaiser normalisation factors a convergence to the five marketing-services sector driver factors of the WQA were reached after only six iterations of rotation.

Table 1: Varimax Factor Loadings: WQA Marketing-Services Sector

Driver (Factor)	Initial Eigen-values			Extraction Sums of Squared Values			Rotation Sums of Squared Values		
	Total	% of Var.	Cum.%	Total	% of Var.	Cum. %	Total	% of Var.	Cum. %
Presence	10.413	41.653	41.653	10.413	41.653	41.653	6.220	24.879	24.879
Val	2.680	10.722	52.374	2.680	10.722	52.374	3.676	14.704	39.582
Searchability	2.110	8.440	60.815	2.110	8.440	60.815	3.570	14.281	53.863
Market	1.743	6.970	67.785	1.743	6.970	67.785	2.702	10.870	64.670
Creativity	1.400	5.603	73.386	1.400	5.602	73.386	2.176	8.716	73.386

Principal factor analysis conducted on the five drivers, yielded all drivers with eigenvalues above 1.0. After Varimax rotation, the first driver (factor) - 'Product Company Presence', reflected that all four features (indicator variables) loaded highly. Similar trends applied to the other marketing-services drivers, albeit at slightly lower levels. The five Varimax drivers (factors) ranged from 24.9% to 8.7% of total variance, and accounted for 73.4% of the total variance. The five factors were subjected to a comparison analysis with eigenvalues calculated using the Montocarlo PCA – Parallel Analysis. All five drivers (factors) chosen had eigenvalues greater than their comparable Monotocarlo compatriates, and were therefore retained.

Table 2: Montocarlo PCA Parallel Analysis: WQA Marketing-Services Sector

Number of variables		20
Number of subjects		200
Number of replications		50
Eigenvalue	**Random Eigenvalue**	**Standard Deviation**
1	1.6046	0.0744
2	1.4861	0.0432
3	1.3997	0.0407
4	1.3241	0.0258
5	1.2659	0.0278
6	1.2035	0.0286
7	1.1532	0.0256

Montocarlo PCA – Parallel Analysis

Table 3: Varimax Factor Loadings: WQA Marketing-Services Sector

Driver (Factor)	Initial Eigen-values			Extraction Sums of Squared Values			Rotation Sums of Squared Values		
	Total	% of Var.	Cum.%	Total	% of Var.	Cum. %	Total	% of Var.	Cum. %
Presence	10.413	41.653	41.653	10.413	41.653	41.653	6.220	24.879	24.879
Val	2.680	10.722	52.374	2.680	10.722	52.374	3.676	14.704	39.582
Searchability	2.110	8.440	60.815	2.110	8.440	60.815	3.570	14.281	53.863
Market	1.743	6.970	67.785	1.743	6.970	67.785	2.702	10.870	64.670
Creativity	1.400	5.603	73.386	1.400	5.602	73.386	2.176	8.716	73.386

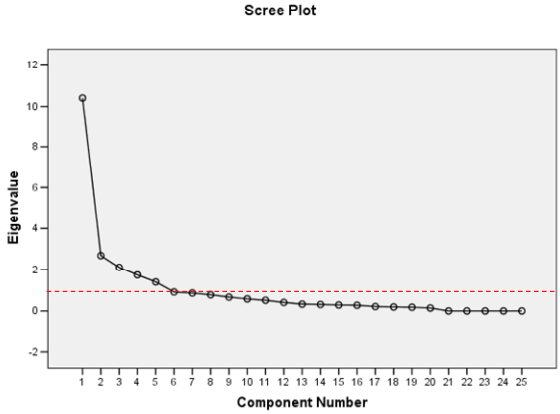

Figure 2: Factor Analysis Varimax Rotation: WQA Marketing-Services Sector

Table 3 and Figure 2 summarise the Rotated Component (Factor) Matrix five driver (factor) outcomes which map the WebQuality Analyser tool.

Table 4 and Figure 3 display a further factor analysis to ensure a more concrete factored model. This Oblique rotation, accounts for any non-orthogonal mapping of factors. Again a high degree of variance is explained by the first five factor components eigenvalues, which explain 68.1% of the total variance.

Table 4: Oblique Factor Loadings: WQA Marketing-Services Sector

Component	Initial Eigen-values			Extraction Sums of Squared Values			Rotation Total
	Total	% of Var.	Cum.%	Total	% of Var.	Cum. %	
Presence	7.421	37.107	37.107	10.413	41.653	37.107	6.094
Searchability	2.100	10.502	47.609	2.680	10.722	47.609	3.806
Value Adding	1.674	8.369	55.978	2.110	8.440	55.978	3.486
Market	1.304	6.519	62.498	1.743	6.970	62.498	1.900
Creativity	1.121	5.603	68.100	1.400	5.602	68.100	2.631

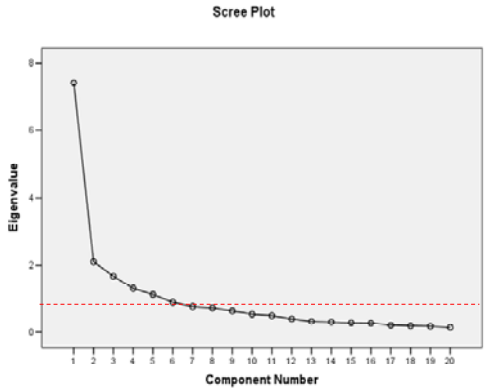

Figure 3: Factor Analysis Oblique Rotation

IV. 3 WQA Marketing-Services Sector

The resulting Pattern and Structure matrices, are displayed in Tables 5 and 6. These matrices were constructed after rotational convergence of nine iterations which strengthened the factors originally computed via the Varimax rotations, the Oblique methods thereby displaying a strong inter-correlation between the factors.

The 'goodness-of-fit' over each of the twenty features (indicator variables), as well as across each indicator variable comprising the five factors. Goodness-of-fit was calculated using Pearson's and Deviance Chi-Square under multi-regression analysis. This resulted in a solid significance of 1.000 for each driver (factor) model. Thus, each marketing-services driver was deemed unidimensional, and driver measurement supports its distinctiveness against the other marketing-services drivers.

Principal Component Analysis; Oblique Rotation with Kaiser Normalisation; Rotation Convergence: 9 iterations.

IV. 4 Reliability Analysis

Individual reliability testing using Chronbach's alpha indicated equal to or greater than 0.5, while composite testing indicated equal to or greater than 0.7. Further testing was achieved utilising Friedman's ANOVA Test (between groups). Here, a large significance of greater than 0.2 showed no difference between the indicators of the services sector driver group. In addition a significance of equal to or greater than 0.05 signified a difference between the indicators of differing services sector driver groups. The entire twenty indicator set provided a composite Chronbach's Alpha of 0.905, and a Friedman's In-Between ANOVA of 0.000, thus indicating significant differences between all groups.

IV. 5 Content Validity & Convergent Validity

Content validity was grounded in the literature, with all indicators (features) of the measurement considered covered across all important aspects of the latent variable (driver) to be measured. In addition extensive pre-testing enabled scales suitable for this research.

Table 5: Oblique Pattern Matrix Factor Loadings: WQA Marketing-Services Sector

	Component				
	Presence	Searchability	Value Adding	Marketing	Creativity
Co. Representation	0.864				
Prod. Representation	0.850				
Product Info.	0.773				
Company Info.	0.624				
Location		0.890			
Accuracy		0.846			
Clicks		0.674			
Price		0.639			
Links			0.809		
Relevance			0.794		
Tools			0.775		
FAQ			0.532		
Portrayal				0.844	
Segmentation				0.720	
Price Range				-0.775	
Promotion				-0.622	
Video					0.842
Theme					0.800
Text					0.712
Photo					0.561

Convergent validity correlated the various indicator measurements (features) required to evaluate the latent variables (driver) to each other. Each indicator variable was tested for convergence using a variety of tools. Considering appropriate chi squared values, and the statistical significance of factorial loadings, a high level of convergent validity was shown – with all Bentler-Bonnett coefficient values close to one (0.975→1.0), and the individual factorial loadings of each driver having t values above 1.96.

Principal Component Analysis; Oblique Rotation with Kaiser Normalisation. (All estimated parameters are statistically significant at 95% (t>1.96))

IV. 6 Discriminant Validity

Discriminate Validity was tested using Bagozzi & Phillips 'pairwise test' to determine whether paired factors fitted the data better than a single factor. A series of chi squared difference tests were conducted. Here, at p values of 0.000, each showed statistically significant differences. Thus from their correlation values, the drivers were interrelated, and each concept differed from the other. Hence, the existence of discriminant validity was affirmed.

V. Discussion

The analysis of marketing-services aspect of this tool has been discussed above. It is a reliable, viable, useful tool.

The WQA offers a simple, yet highly useful, means to compare relevant competitive (or benchmarked) websites. It

offers a mechanism to better understand differences between competitors. A comparative benchmarking standard may be established, allowing a business like an on-line real estate firm to enhance its relative competitive position using value-added features such as - distance to local schools, average time to drive to city, local council contacts, help services, and the like. It may then develop a more 'customerised' [24][25] services-product suite – offering increased 'one-on-one' customer satisfaction [26], and possibly, increased return on investment (and profit) [16].

Table 6: Oblique Pattern Matrix Factor Loadings: WQA Marketing-Services Sector

	Component				
	Presence	Searchability	Value Adding	Marketing	Creativity
Co. Representation	0.843				
Prod. Representation	0.834				
Product Info.	0.723				
Company Info.	0.523				
Location		0.917			
Accuracy		0.862			
Clicks		0.617			
Price		0.604			
Links			0.779		
Relevance			0.717		
Tools			0.666		
FAQ			0.514		
Portrayal				0.800	
Segmentation				0.730	
Price Range				0.611	
Promotion				0.531	
Video					0.827
Theme					0.757
Text					0.695
Photo					0.597

VI. On-Going Research

A valid tool for comparing and benchmarking websites is now under development, with a computerised version of the WQA currently being prepared for commercial release.

One limitation within the marketing-services sector of the WQA remains to be solved. Within a couple of features inside the total IT marketing-services sector, occasional difficulties were encountered by users when rating certain complex feature components. This technical weakness in measurement capture is currently under investigation for both the marketing services, and the IT sectors of the WQA. New additional measurable component datasets are under test, and are likely to be incorporated into the final computerised WQA model.

Another area possibly warranting additional investigation is the issue of 'search', or 'trawling the web to locate a website'. The ability to find a website is vital for both the user and the vendor. Other 'search for airline' studies [20][21], further highlight such problems. Research into 'search' requires additional structured experimentation, and was considered beyond the initial scope of this research.

VII. Conclusions

The marketing-services sector of the WebQuality Analyser (WQA) is an empirically validated, useful tool for the analysis of e-business enabled web sites. When married with its IT sector, two previously disparate approaches to benchmarking websites deliver a new, empirically developed benchmarking and comparison tool. The WQA is more accurate than existing alternatives. It unites: (1) a process oriented analysis involving the stages within the trade cycle, with (2) a HCI approach (focusing on technology, R&D outsourcing, application development, client focus, and core business delivery) treating user or client visits as personalised website e-business–client encounters. Overall, the WQA contains the key elements necessary for valid, detailed, assessment of websites.

The use of the WQA as a benchmarking and comparison tool, also contrasts with the website 'gut reaction' often provided by web users. Schaffer and Sorflatten [91], report that many web users assess a web site as: too slow; disorganised or confusing; or not offering the required service; and then move-on - to other websites! The 'gut reaction' does not deliver an objective basis for benchmarking or comparing websites (other than on a two point scale), nor for planning website improvements. In comparison, the WQA delivers a thorough, empirically supported and well tested benchmarking tool. In addition the WQA delivers an instrument that may be used as a strategic management tool.

Thus, this research supports the use of the WebQuality Analyser's the five marketing–services sector drivers and their inherent features as indicators of marketing-services website quality.

References

[1] Davis, M., Aquilano, N. & Chase, R. *Fundamentals of Operations Management*, McGraw-Hill/Irwin, New York, NY, 2004.
[2] Camp, R. *Benchmarking: The Search for Industry Best Practices That Lead to Superior Performance*, ASQC Quality Press, Milmaukee, WI, 1989.
[3] Hinton, M., Francis, G. & Holloway, J. "Best Practice benchmarking in the UK," *Benchmarking: An International Journal*, 2000, 7(1), 52-61.
[4] Hammer, M. & Champy, J.. *Reengineering the Corporation*, Harper Business, New York, NY, 1993.
[5] Evans, N. *Business Innovation and Disruptive Technology*, Prentice Hall, Upper Saddle River, NJ, 2002.
[6] Raturi, A. & Evans, J. *Principles of Operations Management*, Thompson South-Western, Ohio, 2005.
[7] Mansar, S. Reijers, H. "Best practices in business process redesign: validation of a redesign framework," *Computers in Industry*, 2005, 56(5), 457-471.
[8] Porter, M. *Competitive Strategy: Techniques for analysing industries and competitors*, Free Press, New York, NY, 1980.
[9] Porter, M. *Competitive Advantage: Creating and Sustaining Superior Performance*, The Free Press, New York, NY, 1985.
[10] Cairns Super-Yacht Cluster, CREDC Information Page – Super-Yacht

Cluster, 2005. Retrieved 1 Sept 2005 at: http://www.credc.com.au/cluster_superyacht.html.
[11] Carlson, J., RosenbergerIII, P. & Muthaly, S. “Nothing but Net! A Study of the Information Content in Australian Professional Basketball Websites,” *Sport Marketing Quarterly*, 2003, 12(3), 84-189.
[12] Ertore, B. “Managing Competitive Intelligence,” *Management Review*, 1995, 10, 15-19.
[13] Choo, C. “Environmental scanning as information seeking and organizational learning,” *Information Research*, 2001, 7(1), 86-102.
[14] Microsoft Research Retrieved 10 April 10 2005 at: http://research.microsoft.com
[15] Shank, P. Learning anew: An Exploratory study about online learners’ perceptions of people interaction and learning to learn in an online course, In P. Barket& S. Rebelsky (eds.), *Proceedings of Educational Multimedia, Hypermedia, & Telecommunications*, 2002, 2167-2171.
[16] Hamilton, J. “Service Value Networks: a New Approach to Performance and the Delivery of Services,” *The E-Business Review*, Nacogdoches, Texas, 2005, 5(1) 66-71
[17] TYPO3, “Website Features,” 2005. Retrieved 12 May 2004 at: www.typo3.com/feature_list.1234.0html.
[18] Sterne, J. Web Metrics, Wiley, New York, NY, 2002.
[19] Van der Wiele, T., & Brown, A. “Venturing Down the TQM Path for SMEs,” *International Small Business Journa,l* 1998, 16(2), 50-68
[20] Whiteley, D. & Miller, K. “e-Commerce: Flying in the Face of Competition,” *BIT World’99 Conference*, 1999, June, Cape Town, South Africa.
[21] Whiteley, D. *The Complete e-Shop*, Spiro Chandos, Oxford, London, 2002.
[22] Hersey, I., Whiteley, D., Miller, K. and Quick, P. Internet e-Commerce: Buying the book and catching the plane, *Department of Computing and Mathematics*, Manchester Metropolitan University, UK, 1999.
[23] Everett, A. Paynter, J & Xiaohong, L “An Analysis of e-Mortgage Sites in New Zealand,” *3rd International Conference on Electronic Business*, Singapore, 2003, Dec. 9-13, 85-87.
[24] Hamilton, J. & Selen, W. “Integrating Web Site Design Features for ‘one-on-one’ Marketing: a QFD Framework,” In Proceedings (and CD ROM) *7th International Conference on ISO9000 and TQM*, Melbourne, Australia, 2002, 7(10), 1-8.
[25] Hamilton, J. & Selen, W. “Strategic Positioning Matrix for Real-estate Management in Australian: Implementing E-business From Competitive Advantage,” *International Journal of E-Busines*, 2004, 2(4), 383-403
[26] Gunesh, R. & Hamilton, J. “Incorporating Customer Interface Marketing Design Elements to Leverage Strategic Positioning in the On-line Real Estate Industry,” *Hawaii International Conference on Business 2003*, Honolulu, Hawaii 2003, Jun, 1-9,
[28] Paynter, J., Satikit, S. & Chung, W. “Towards an Internet site usability evaluation model,” *1st International Conference on Electronic Business*, Hong Kong, 2001, Dec, 239-241.
[29] Barton, K, Duncan, B Ruiz-Neito, L. & McKellar, P. “E-commerce and legal practice in Scotland: a benchmarking survey,” *Journal of Information, Law and Technology and 15th BILETA Conference*, 2000, April, 1-22.
[30] Ho, J., “Evaluating the World Wide Web: a global study of commercial sites,” *Journal of Computer Mediated-Communications*, 1997, 3(1), 1-6.
[31] Mann, R. & Grigg, N. “Helping the Kiwi to Fly: Creating World-Class Organizations in New Zealand Through a Benchmarking Initiative,” *Total Quality Management*, 2004, 15(5-6), 707-718.
[32] w3c.org/, “Web Content Accessibility Guidelines 2.0,” 2001. Retrieved 10 May 2001 at: http:/www.w3c.org/tr/2001/WD-WCAG20-20010125/.
[33] Hexagonal Comparison Grid, Namics Ltd, 2004. Retrieved 30 January 2004 at: http://www2.namics.com/files/NAM_Prod_ Web_Assessment.pdf.
[34] Levine, R., *Guide to Web Style: Quick Reference*, Sun Microsystems, Inc, 1996, Aug.
[35] Lynch, P. & Horton, S., *Basic Design Principles for Creating Web Sites: Web Style Guide*, Yale University Press, 1999. Retrieved 12 May 2002 at: http://info.med.yale.edu/ caim/manual/misc/book.html.
[36] Spyridakis, J. “Guidelines for Authoring Comprehensible Web pages and Evaluating their Success,” *Technical Communication*, 2000, 47(3), 359-382.
[37] Sterne, J., *World Wide Web marketing: integrating the Internet into your marketing strategy*, John Wiley and Sons, Inc, USA, 1995.
[38]] GVU, “GVU's WWW User Surveys,” 1999. Retrieved 12 May 2002 at: http://www.cc.gatech.edu/gvu/user_surveys/.
[39] Conger, S. & Mason, R. *Planning and Designing Effective Web Sites*, International Thomson Publishing Co., USA, 1998.
[40] Hoffman, D., & Novak, T. “Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations,’ *Journal of Marketing*, 1996, 60, July, 50-68.
[41] Hoffman, D., Novak, T. & Yung, Y. “Measuring the Customer Experience in Online Environments: A Structural Modeling Approach,” *Marketing Science*, (Special Issue ‘Marketing Science and the Internet), 1999.
[42] Hoffman, D., & Novak, T. “When Exposure-Based Web Advertising Stops Making Sense (And What CDNOW Did About It),” *Harvard Business Review*, 2000, May/June.
[43] Hoffman, D., & Novak, T. “Advertising Pricing Models for the World Wide Web,” In *Internet Publishing and Beyond: the Economics of Digital Information and Intellectual Property*, Hurley, D., Kahin, B & Varian, H., (eds.), MIT Press, Cambridge, 2000a.
[44] Schaffer, E. and Sorflaten J. „Web Usability Illustrated: Breathing Easier with your Useable E-Commerce Site,” *EDI Forum: The Journal of Electronic Commerce*, 1998, 11(part 4), 50-52, 57-64, 101.
[45] “Devens Learning Center,” 1999. Retrieved 8 May 2002 at: http://www.net1plus.com/users/devenslc/designing.html.
[46] Conger, S., & Mason, R.. *Planning and Designing effective Web sites*, Course Technology, Cambridge, MA, 1998.
[47] Ambler, S. “Designing Web-Based User Interfaces’,” *Journal of Software Development*, 2001, 9(3), 61-63.
[48] Bruner II, G., & Kumar, A. ,Web Commercials and Advertising Hierarchy-of-Effects,” *Journal of Advertising Research*, 2000, 40(1/2), 35-42.
[49] Chen, Q., & Wells, W. “Attitude Toward the Site,” *Journal of Advertising Research*, 1999, 39(50, 27-37.
[50] Wells, W. “Recognition, Recall and Rating Scales,” *Journal of Marketing Research*, 2000, 40(6), 14-20.
[51] Ford, A, *Spinning the Web: how to provide information on the Internet*, International Thompson Computer Press, UK, 1995.
[52] Sampson, D. *E-Business – Value Creation for Management*, McGraw-Hill/Irwin, New York, NY, 2003.
[53] Chaffey D. *E-Business and E-Commerce Management*, (2nd ed.), Prentice Hall, Upper Saddle River, NJ, 2004.
[54] Cook, J., *The Sevloid Guide to Web Design*, 1997. Retrieved 12 May 2002 at: http://www.sev.com.au/ webzone/design.asp.
[55] Whitfield, N., “Make your own Website,” *Computer Active*, 1999, 46, 76-82.
[56] Nemzow, M., *Building Cyberstores*, McGraw-Hill, New York, 1997.
[57] Berners-Lee, T., *Style Guide for Online Hypertext*, 1998. Retrieved 12 May 2002 at: http://www.w3.org/Provider/Style/.
[58] Evans, N. *Business Agility*, Prentice Hall, Upper Saddle River, NJ, 2002.
[59] Pechmann, C.,& Stewart, D. “The Effects of Comparative Advertising on Attention, Memory and Purchase Intentions,” *Journal of Consumer Research*, 1990, vol. 17, 180-191.
[60] Von Versen, K. “The three commercial functions of the Internet,” *Electronic Markets*, 1999, 8(4). Retrieved 15 May 2002 at: http://www.electronicmarkets.org/netacademy /publications.nsf/ all_pk/1249
[61] Neilsen, J., *Designing Web Usability*, New Rider’s Pub., 2000, 16-51.
[62] Allen, C., Kania, D. & Yaeckel, B. *Internet World: Guide to One-to-One Web Marketing*, John Wiley and Sons, New York, NY, 1998.
[63] Schubert, P. & Selz, D., “Web assessment – measuring the effectiveness of electronic commerce sites going beyond traditional marketing paradigms,” *Electronic Markets*, 1997, 7(3). Retrieved 10 May 2002, at: http://www.electronic markets.org/netacademy/publications.nsf/all_pk/195.
[64] Coulpey, E. *Digital Business*, (2nd ed.), Pearson-Prentice Hall, Upper Saddle River, NJ, 2005.
[65] Turban, E., King, D., Lee, J. & Viehland, D. *Electronic Commerce*, Pearson-Prentice Hall, Upper Saddle River, NJ, 2004.
[66] Simon, S. The Impact of Culture and Gender on Web Sites: An Empirical Study, *Electronic Commerce*, 2001, 32(1), 18-37.
[67] Neiderst, J., *Learning Web Design*, O’Reilly & Associates, 2001, 285-356.

[68] Zhang, X., Keeling, K. & Pavur, R. "Information quality of commericial web site home pages: an explorative analysis," In Proceedings, *21st International Conference on Information Systems*, Brisbane, Australia, 2000, 164-175.
[69] Cognitiative, "E-Commerce and the Evolution of Retail Shopping Behaviour," *Pulse of the Customer*, 1999, 1(2), Retrieved June 5, 2001, at: http://wwwcognitiative.com/.
[70] Haubl, G. & Trifts; V. „Consumer decision making in on-line shopping environments: The effects of interactive decision aids," *Marketing Science*, 2000, 19(1), 4-21.
[71] O'Connor, J., Galvin, E. & Evans, M. Electronic Marketing, Prentice Hall, Upper Saddle River, NJ, 2004.
[72] Dholakia, U. & Bagozzi, R. "Goal Setting and Goal striving in Consumer Behaviour," *Journal of Marketing*, 1999, 63, 19-32.
[73] Mohammed, R., Fisher, R., Jaworski, B. & Paddison, G. *Internet Marketing*, (2nd ed.), McGraw-Hill/Irwin, New York, NY, 2004.
[74] Weber, J. The Bottom Line, *The Industry Standard*, 1999, 9(5), Aug.
[75] Porter, M. Strategy and the Internet, *Harvard Business Review*, 2001, 79(3), 63–78.
[76] Siegel, D., *Creating Killer Web Sites: the art of third generation Web design*, Hayden Books, New York, NY, 1997.
[77] Van der Wiele, T., & Brown, A. Venturing Down the TQM Path for SMEs. *International Small Business Journal*, 1998, 16(2), 50-68.
[78] Miller, G., "The Magical Number Seven Plus or Minus Two: Some Limits to our capacity for Processing Information," *Psychology Review*, 1956, 64, 81-97.
[79] Berger, A. *Media analysis techniques*, Sage, Newberry Park, CA, 1982, 107-110.
[80] Hair, J., Anderson, R., Tatham, R. & Black, W. *Multivariate Data Analysis*, Prentice Hall, Upper Saddle River, NJ, 1998.
[81] Cooper, D. & Schindler, P. *Business Research Methods*, (8th ed.), McGraw-Hill/Irwin, New York, NY, 2003.
[82] Schaffer, E. and Sorflaten J. „Web Usability Illustrated: Breathing Easier with your Useable E-Commerce Site," *EDI Forum: The Journal of Electronic Commerce*, 1998, 11(part 4), 50-52, 57-64, 101.

Author Profiles:

John Hamilton is the Director of E-Business at James Cook University. His extensive domestic business ownership and management experience includes: importing, exporting, mining, rural, wholesale, manufacturing, and several small-medium businesses (supermarket, video wholesale, fashion stores, florist/gifts, restaurants,) His international business experience includes: Sapphire mining, processing and gemstone sales; plastics manufacturing; importing/exporting; and international finance.

John Hamilton is a driver of innovation, market leadership, and creative thinking. He developed: the world's first abalone aquaculture farm - and perfected live export techniques (1980-4); rock lobster aquaculture procedures (1981-4); a plastics manufacturing plant in China (1987-8); computerised sapphire gem cutting machine technologies (1991), offshore financing procedures (1991), Ed .Qld.'s Centre of IT Excellence - programming, database implementation, e-commerce, multimedia, robotics and communications technologies (1994-2001); and JCU's MBA/MIT E-Business strategic initiative (2002-2005).
John Hamilton has extensive business, management, consulting and research experience. He is an active researcher. His current specialisations include: development of strategic web-based instruments; QFD; strategic positioning; strategic e-marketing; logistics, killer strategies for business; service value networks, industry-wide future technologies and solutions; and the performance, value and alignment of customer-business interfaces.

Roy Wybrow has worked in IT/IS business related fields including aircraft R&D, engineering, e-commerce and ERP for various MNE's in Vietnam, China, Malaysia, Fiji, Papua New Guinea, and Australia.

He lectures in statistics, e-business, communications technologies and venture management at James Cook University.

He is a skilled researcher, especially in the statistics and information technologies arena. He is currently researching across a wide range of industrial sectors to determine the factors driving successful industrial clusters.

His consulting firm has identified, developed, and commercialised, many unique business solutions including: computerised fruit picking, energy efficient housing, sophisticated IT/IS solutions for business, and value adding, peripheral, sugar-based industries and associated industrial clusters. He has also consulted, developed and implemented Balance Scorecards for SME's.